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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/591,785	07/30/2007	Hassan Abdullahi	011235.58178US	4958

23911 7590 06/01/2011

CROWELL & MORING LLP
INTELLECTUAL PROPERTY GROUP
P.O. BOX 14300
WASHINGTON, DC 20044-4300

EXAMINER	
ROBERTSON, DAVID	
ART UNIT	PAPER NUMBER
2121	
MAIL DATE	DELIVERY MODE
06/01/2011	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/591,785	ABDULLAHI ET AL.	
	Examiner	Art Unit	
	Dave Robertson	2121	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 May 2011*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *7-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *7-21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *05 September 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This is a Final office action in response to Applicant's reply of 5/3/2011. Claims 7-21 are pending.

Response to Amendment

2. Applicant cancels claims 4-6. Accordingly, the rejections previously made as to claims 4-6 are withdrawn. Claims 7-21 remain as previously presented.

Response to Arguments

3. Applicant's arguments filed 5/3/2011 have been fully considered but they are not persuasive:

Applicant argues Duncan et al. does not disclose "comparing actual values of thermal spray coating process with target values", rather that Duncan teaches comparing actual values with *ideal values* as distinct from *target* values (Remarks, pg. 6).

However, Duncan et al. includes both monitoring and control of the parameters of a thermal spray coating process (see Background; esp. column 3, lines 57-67). In a control process, generally, "target" values are desired values of the process; "ideal" values are by definition *desired values* and suffice as a teaching of target values in the controlled process. Applicant's argument that Guessasma et al. instead teaches deriving "ideal" or "predicted" values fails similarly, in that however target values are

obtained for a controlled process, these are the values for which the process parameters are controlled against the actual measurements.

Examiner further notes for an understanding of the basis of the rejections to follow, that Duncan et al. is used as a base method and apparatus for coating a workpiece by a thermal spray coating process. Guessasma et al. is used to teach and suggest further development in the field, including use neural network-based thermal spray process parameter controls, namely, using a neural network to map relationships between input variables and output variables of a process expressly for the purpose of controlling a thermal spray coating process. The combination of Duncan et al. and Guessasma thus suggests applying a known technique to known device, method, or product that is ready for improvement is obvious because the particular known technique was recognized as part of the ordinary capabilities of one skilled in the art, who would have been capable of applying this known technique to the known device, method, or product, and the results would have been predictable to one of ordinary skill in the art. *KSR International Co. v.Teleflex Inc. (KSR), 550 U.S. ___, 82 USPQ2d 1385 (2007).* MPEP ¶ 2141 [R-6].

Accordingly, the rejection(s) of the previous office action is/are maintained and updated per Applicant's amendment cancelling the base claims 4-6 on which rationale(s), with extension, claims 7-21 previously relied.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 7-21 rejected under 35 U.S.C. 103(a) as being unpatentable over in view Duncan et al. (US Pat. No. 7,290,589) in view of Guessasma et al. ("Modeling of the APS plasma spray process using artificial neural networks: basis, requirements and an example," March 2004)

Claim 7

Duncan et al. teaches **a method for coating a workpiece** (see Abstract)**, comprising the steps of:**

applying a material to the workpiece by a thermal spray coating process (see Background, methods and apparatus of spraying "molten droplets")**;**

monitoring the thermal spray coating process … comparing the actual value with a target value for the property… and automatically adjusting a process parameter for the thermal spray coating process … when there is a deviation between the actual value and the target value for the property … (see column 3, lines 47-67: Duncan describes a control process for thermal spraying, the process control sensitive to optimization of properties of molten droplets in a thermal spray deposition process)**;**

However, Duncan et al. does not expressly teach monitoring **by detecting an actual value of a property of a particle in a spray jet of the thermal spray coating process;** or automatically adjusting **by a neuro-fuzzy regulator … based on a neuronal network with fuzzy logic rules, wherein the neuronal network maps a relationship between an input variable and an output variable of the neuro-fuzzy regulator.**

Guessasma et al. expressly teaches a method for controlling thermal spray coating processes using neural networks to create and map statistical relationships between input variables and output variables (see Abstract; Introduction), wherein the thermal spray coating process is monitored on-line by detecting properties of particles in a spray jet (see Results Section 5.2 *In-flight particle characteristics*). Guessasma is expressly directed to improving the processes of Duncan to improve the deposition yield of thermal spray coating control processes.

Applying a known technique to known device, method, or product that is ready for improvement is obvious if the particular known technique was recognized as part of the ordinary capabilities of one skilled in the art, who would have been capable of applying this known technique to the known device, method, or product, and the results would have been predictable to one of ordinary skill in the art. *KSR International Co. v.Teleflex Inc. (KSR), 550 U.S. ___, 82 USPQ2d 1385 (2007).* MPEP ¶ 2141 [R-6].

Duncan and Guessasma being directly in the art of the invention, and Guessasma expressly directed to the improvement of apparatus and processes such as Duncan, it would have been obvious to one of ordinary skill in the art at the time of the

invention to improve the apparatus and methods of Duncan with the technique of Guessasma in order to improve the deposition yield of thermal spray coating control processes, with the predictable results (as taught by Guessasma, see Table 3 and related discussion) of improving the performance of the deposition process leading to higher yields in the resulting coating product.

Claim 8-13

Duncan et al. teaches or suggests **the method according to Claim 7, wherein the step of comparing the actual value with the target value for the property includes deriving a characteristic quantity for the property from the actual value and comparing the characteristic quantity with the target value** (column 3, lines 47-56: the basis of control, comparing "characteristic quantities" or measurements of properties to target or desired or ideal values)**; wherein the thermal spray coating process is a plasma spray process** (see Background, arc-spray deposition of a molten metal is a "plasma" spray process).

Duncan et al. teaches the criticality of temperature and size of particles in thermal spray processes and thus suggests controlling parameters of **temperature** (column 1, lines 44-67: teaching *temperature* as a characteristic of the particle of the electric arc spray guns) and **velocity** (column 2, line 57: where "scan velocity" is (broadly) a velocity of the particle (transverse at least), including, however, Duncan does not expressly teach wherein the properties *detected* for the spray jet include **particle temperature, velocity, size** or **luminous intensity.**

Guessasma, expressly teaches monitoring (i.e. "detecting") temperature, velocity, and size of particles (see page 324; Section 5.2) using infrared pyrometic tools (pg. 320, Section 3.2). For reasons given above with respect to Duncan et al. in combination with Guessasma suggesting the invention of claim 7, and further noting Guessasma et al. in Figure 2 (pg. 317) teaching temperature, velocity and diameter as "**in-flight particle characteristics**", **wherein the property is a luminous intensity of the particle** (broadly, a property (intensity of light lumens in the infrared) detected by a thermal imaging camera), it would have been obvious to one of ordinary skill in the art at the time of the invention to include *detection* of these particle characteristics, predictably resulting in improved deposition yields.

Claims 14-16

Duncan et al. teaches or suggests **the method according to Claim 7,** and in view of Guessasma as above the use of **a layered artificial neuronal network (ANN)** (Figure 3); however neither Duncan nor Guessasma *expressly* teach **wherein the neuronal network comprises at least four layers each having multiple neurons, wherein the neurons of an input layer map a fuzzification, the neurons of an output layer map a defuzzification, and the neurons of the layers arranged between the input layer and the output layer map a fuzzy inference.**

Guessasma is an illustration of an example artificial neural network (ANN), where neural networks are known in the art to contain more than three layers depending on design choices reflecting desired precision or speed of the network or training of the network. It would have been obvious to one of ordinary skill in the art at the time of the

invention to provide *four* layers in the ANN as this would have predictably resulting in more precision in tradeoff for training speed or in more or less of other characteristic or performance tradeoffs. Further, neural networks are known to be closely associated with concepts of fuzzy logic, where approximations are provided by the operation of the neural network with data input layers providing "fuzzification" and data output layers providing "defuzzification" as an operation of the ANN. Similarly, as to claims 15 and 16, the passing of inputs to outputs in a neural network is a **mapping a relationship… processing… and converting… to an output variable**; and **processing…** by an ANN is processing **by linguistic rules and fuzzy operators, wherein the step of processing the fuzzy variable by the second layer of the neuronal network includes the step of processing by linguistic rules and fuzzy operators** (Figure 3)**.**

Claims 17-21 recite apparatus for performing the methods of claims 7-16 as above, and are similarly rejected for reasons given above, for the respective claim and claim elements, and further that Duncan et al. and Guessasma each teaches apparatus for the performing, including **a camera** (Duncan Figure 1 (5) suggesting Guessama's "infrared pyrometic tools"), **and an image processing system** (see Duncan, column 7, performed with Figure 1 (5) and (6) the computer); and **wherein an actual value of a property of a particle in the spray jet is determined by the image processing system from an image of the spray jet obtained from the camera** (see Duncan et al. Figure 1 (5) Thermal Imaging Camera in view of Guessasma Figure 1, 6, and 7)**.**

Conclusion

6. The prior art made of record and listed on the attached PTO Form 892 but not relied upon is considered pertinent to applicant's disclosure. In particular:

Kanta et al. ("Plasma Spray Process On-Line Control by Artificial Intelligence Methodology", Advanced Engineering Materials, February 2007) is cited as background materials for state of the art and prior work citations related to the subject matter of the present invention.

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Examiner believes prosecution may be advanced by Interview following receipt of this office action and review of the cited art of record. The Examiner may be reached at the telephone number indicated below.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dave Robertson whose telephone number is (571)272-8220. The examiner can normally be reached on Weekdays 8:15 am to 4:15 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Albert Decady can be reached on (571) 272-3819. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Dave Robertson/
Examiner, Art Unit 2121